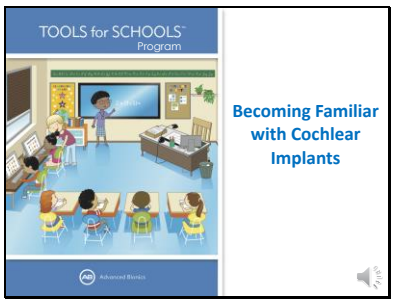
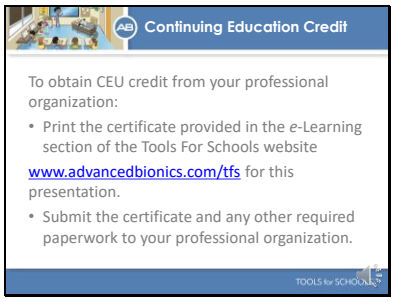
Slide 1



Hello and thanks for joining us to learn more about cochlear implants. Today's presentation provides a basic overview about hearing and cochlear implants. It is the first part of a two-part presentation title Becoming Familiar with Cochlear Implants.

Slide 2



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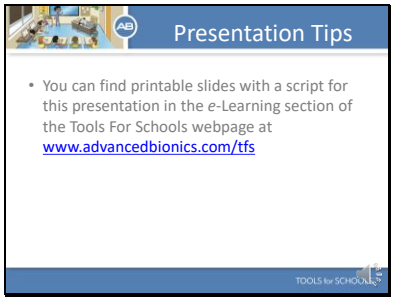
Slide 3

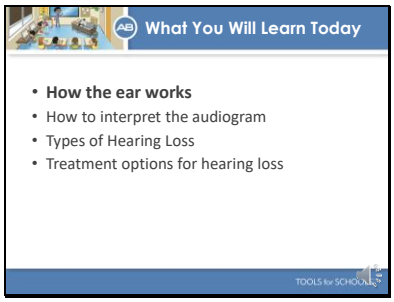


If you would like to print out slides and take notes, or print out a script so you can follow along with the audio, please visit the companion materials section for this presentation in the e-learning section of the TFS webpage.

Slide 4

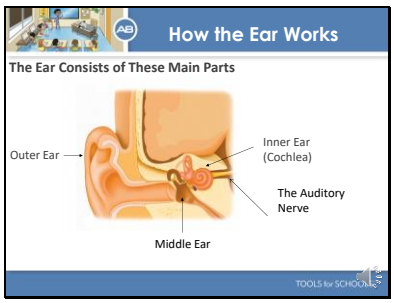
Speaker's Notes: AB is dedicated to helping people with hearing loss hear their best. AB has partnered with Phonak. This partnership has allowed AB to offer unique technological advances to help people with hearing loss hear better in the most challenging listening situations. From offering technologies that grow with children as they learn to listen and make sense of the world of sound… To helping adults get back to connecting and communicating with the important people in their lives, AB is dedicated to providing the unique hearing technologies that can help recipients achieve their hearing goals.

Slide 5



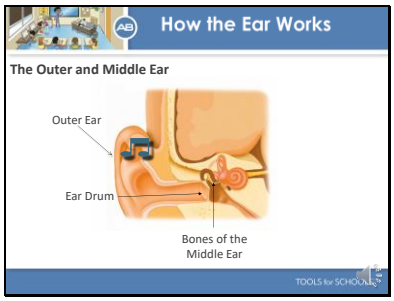
Here are the topics we are going to discuss today.

Slide 6



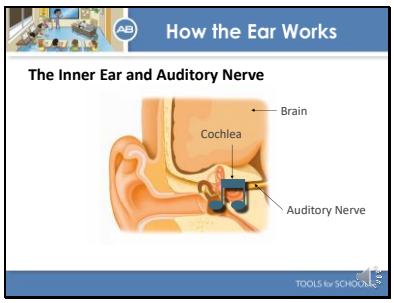
Speaker's Notes:
For sound to be heard, the ear needs to convey the message to the brain. The ear consists of four main parts: the outer ear, middle ear, inner ear, and the auditory nerve. Each of these parts plays a key role in transmitting sound to the brain.

Slide 7



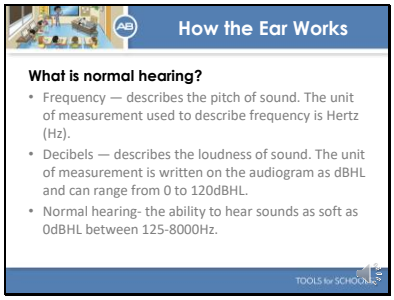
The process for hearing begins with the outer ear. Sound enters the ear canal via the outer ear in the form of a sound waves. The shape of the outer ear amplifies important sounds and helps to reduce competing noise. The sound waves then travel down the ear canal striking the ear drum, causing it to vibrate. Vibrations from the ear drum cause the tiny bones in the middle ear (malleus, incus, & stapes) to vibrate and push against the cochlea.

Slide 8



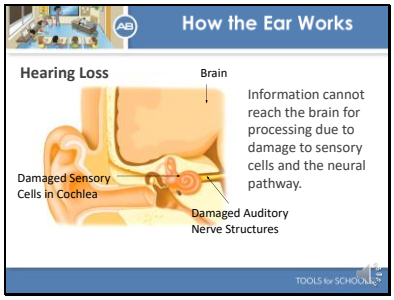
The inner ear or cochlea contains thousands of sensory hair cells bathed in fluid. As the middle ear bones vibrate and push against the cochlea, fluid in the cochlea moves causing the hair cells to bend and sway. As they move, they communicate information about pitch and loudness in an electrochemical code to the auditory nerve. The auditory nerve then transmits this information to the brain where it is interpreted as sound.

Slide 9



Hearing is considered normal when all parts of the hearing system are working properly and individuals can hear sound that is very soft to very loud over a wide range of pitches. Audiologists use special terms to describe pitch and loudness.
Frequency — describes the pitch of sound. The unit of measurement used to describe frequency is Hertz (Hz).
A low-pitched sound like thunder has a frequency of about 100Hz. A high-pitched sound like a bird singing has a frequency of about 8,000Hz.
Decibels — describes the loudness of sound. The unit of measurement is written on the audiogram as dBHL. A very soft sound like a whisper has a dB level of about 20dBHL. A very loud sound like an airplane taking off has a dB level of about 120dBHL . Using these terms audiologists define normal hearing as the ability to hear sounds as soft as 0dBHL – 25dBHL between 125-8000Hz.

Slide 10

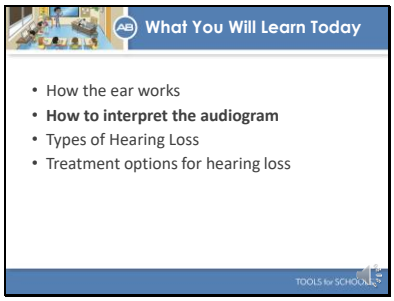


Permanent hearing loss typically occurs when individuals have damage to the sensory hair cells of the cochlea and/or the neural pathway from the auditory nerve to the brain. This type of hearing loss is referred to as a sensorineural hearing loss and can range from mild to significant, depending on the extent of sensory cell loss or damage. For an individual with hearing loss, sounds delivered pass through both the healthy and damaged parts of the hearing system before reaching the brain. The loudness and clarity of the sounds depends on the number of functioning hair cells inside the cochlea and the integrity of the auditory nerve and pathway.

Slide 11

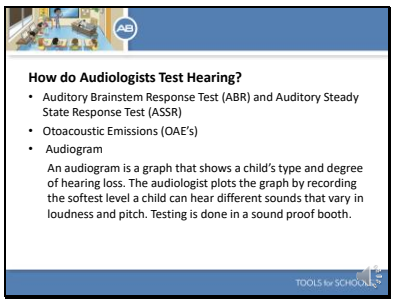
Did you know that almost 15% of school-age children (ages 6-19) have some degree of hearing loss? This means that 1 in every 7 students may be struggling in the classroom if not treated with appropriate amplification.

Slide 12



Are you wondering how an audiologist is able to determine the frequencies and decibel levels a child is able to hear? Audiologists use special tests to gather this information. Let's learn more about them.

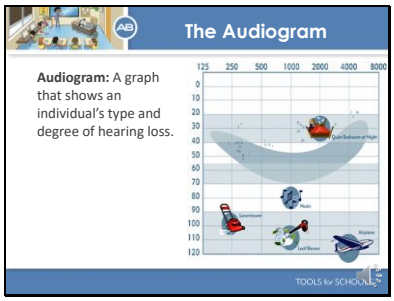
Slide 13



There are several ways an audiologist can test the hearing of children. The first two methods we will discuss do not require a child to be an active participant and are commonly used with babies and toddlers. They give us good information about how a child hears but are not as accurate as an audiogram. Let's briefly discuss the first 2 methods now. The Auditory Brainstem Response Test (ABR) and Auditory Steady State Response Test (ASSR) use a special computer program in combination with electrodes that are placed close to the ears and on the head to measure the

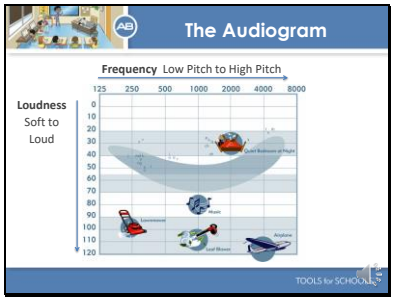
brain's response to sound. As sounds are played through headphones the electrodes measure how the brain responds. The audiologist uses the computer program to assist in determining the degree of hearing loss. Another test used to access hearing is Otoacoustic Emissions (OAE's). This test measures soft sounds, called otoacoustic emissions, given off by the inner ear. The measurement is done by placing a small microphone in the ear canal. Individuals with hearing loss greater than 25-30dBHL do not produce these soft sounds. The OAE test is part of a battery of tests and cannot be used to identify the type and degree of hearing loss on its own. Now let's discuss the Audiogram. An audiogram is a graph that shows a child's type and degree of hearing loss. The audiologist plots the graph by recording the softest level a child can hear different sounds that vary in loudness and pitch. Testing is done in a sound proof booth. Again, the audiogram requires active participation and cooperation and is considered the most accurate and specific way to test hearing. Since babies and very young children cannot typically cooperate for testing pediatric audiologists will use a combination of all the tests described to understand a child's type and degree of hearing loss. As children mature and become more familiar with testing, pediatric audiologists will be able to collect a full audiogram, even on young children. Let's see what an audiogram looks like.

Slide 14



Here is a picture of an audiogram. Again, it is a graph that shows an individual's type and degree of hearing loss. An audiologist plots the graph by recording the softest level an individual can hear different sounds that vary in loudness and pitch. Testing is done in a sound proof booth.

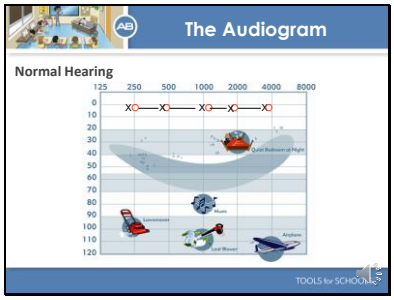
Slide 15



The horizontal axis of the graph indicates the pitch also known as frequency (Hz). Sounds become higher in pitch as you move from left to right in the direction of the arrow. The vertical axis of the graph indicates loudness, measured in (dBHL). The sounds increase in loudness level as you move down the graph in the direction of the arrow. This audiogram is called the Audiogram of Familiar Sounds as it plots common sounds as well as speech sounds according to the pitch and loudness level they most commonly occur. For example, the

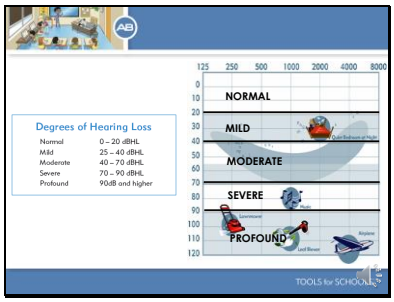
sound of an airplane occurs at a frequency of about 4,000Hz at about 120dBHL and is extremely loud. Compare this to the “p”sound which occurs at a frequency of about 1,500Hz at 25dBHL which is very soft. Take a minute to see if you can figure out the frequency and dB level of a quiet bedroom at night. The correct answer is 30dBHL at about 2000Hz.

Slide 16



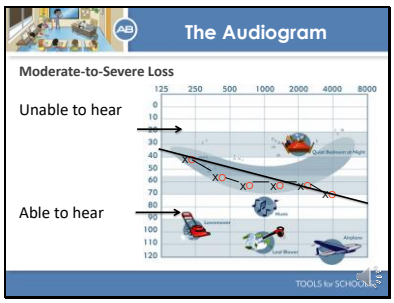
An individual who can hear normally, has responses on an audiogram which fall between 0-25dBHL along the top of the graph. Right ear responses are recorded with an (O) and left ear responses are recorded with an (X).

Slide 17



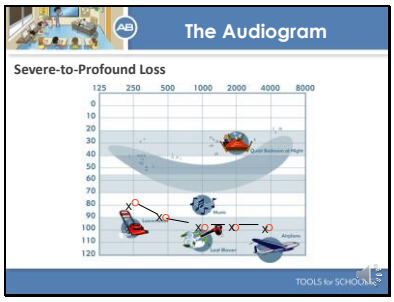
Hearing loss is discussed in terms of degrees. There are five degrees used to describe hearing. Normal, Mild, Moderate, Severe and Profound. You can see how they are broken down on this audiogram.

Slide 18



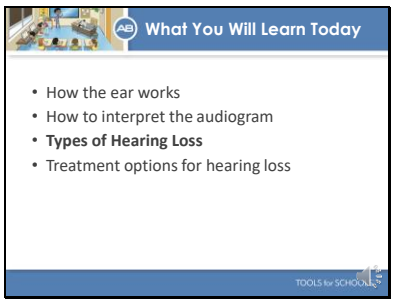
A person has hearing loss when responses are obtained at dB levels higher than 25dBHL. As the severity of hearing loss progresses the responses on the graph fall closer to the bottom of the audiogram. Here you see the hearing test results of someone with a moderate to severe hearing loss. They are able to hear anything that is under their plotted graph but not anything that is above it. You can see that this person is not able to hear most of the speech sounds.

Slide 19



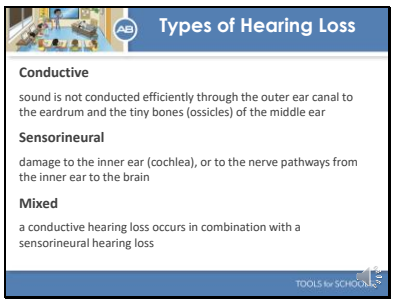
Here is an individual with a severe to profound hearing loss. Responses are in lower portion of the graph. You can see that this person is unable to hear speech and many environmental sounds.

Slide 20



Now let's discuss the different types of hearing loss.

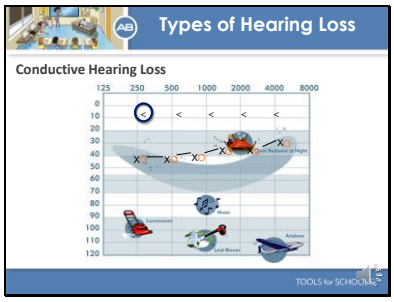
Slide 21



There are three different types of hearing loss. We are going to begin by talking about a conductive hearing loss. This type of hearing loss is usually caused by a problem in the outer or middle ear. This type of hearing loss can be temporary or permanent. An ear infection that causes temporary hearing loss until treated is an example of a conductive hearing loss. The treatment for conductive hearing loss varies widely depending on the cause but may include options such as taking antibiotics or receiving ear tubes. A Sensorineural hearing loss is due to damage to the inner ear (cochlea and hair cells), and/or the auditory nerve pathway from the inner ear to the brain. This type of hearing loss is almost always permanent and depending on the degree of hearing loss is typically treated by fitting hearing aids or receiving a cochlear implant. Finally, a Mixed hearing loss results from a combination of conductive and sensorineural components. The conductive part of the hearing loss can be temporary or permanent. The sensorineural part of the hearing loss is almost always permanent. An ear infection that occurs in a child who already has a sensorineural hearing loss is an example of a mixed hearing loss. This type of hearing loss may be treated with hearing aids, cochlear implants, or other methods, depending on several factors which are beyond the scope of this presentation.

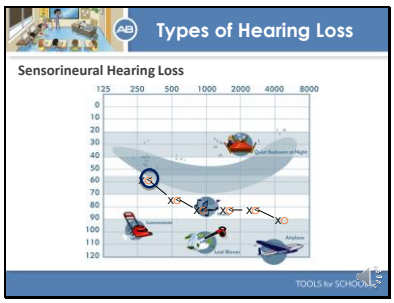
Speakers Notes: When we talk about a sensorineural hearing loss, we are referring to a loss of hearing function which occurs in the inner ear or along the neural pathway. There are other types of hearing loss as well, such as conductive and mixed hearing losses. which involve the middle ear, this can be temporary or permanent. A conductive or mixed loss is not considered appropriate for treatment with a cochlear implant.
There are 3 different types of hearing loss.

Slide 22



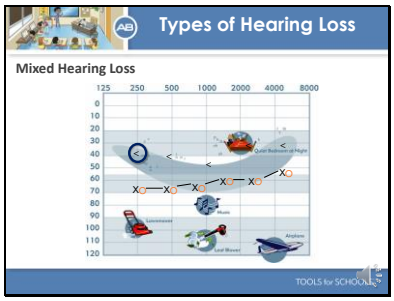
This is an example of a conductive hearing loss. Looking at the audiogram, you see the X and O symbols for hearing which were described a few moments ago. There are added symbols that look like carrot marks over the ‘x’ and ‘o’’s. These represent bone conduction, or responses to sound presented via a special headphone that stimulates the cochlea directly. Here you see the bone conduction symbols fall within the normal range compared to the ‘x’ and ‘o’. This is considered a conductive loss. This might be the kind of audiogram that is found in a child with an ear infection. This child of course would not qualify for a cochlear implant.

Slide 23



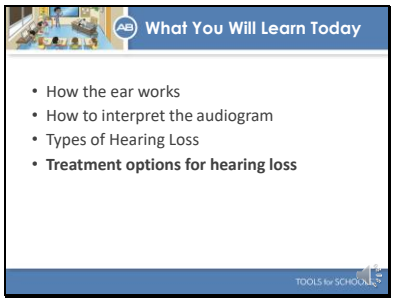
This is an example of a sensorineural hearing loss. Here you can see the bone conduction symbols overlap with the X's and O's. When all of the symbols line up, or there is no gap, then the loss is sensorineural and permanent.

Slide 24



Here is an example of a mixed hearing loss. You see here that the symbols for bone conduction are lower on the graph than what is considered "the normal range of hearing". The X's and O marks are also in the range of hearing loss. There is a gap and both sets of symbols are in the hearing loss range. An individual who has a sensorineural hearing loss and then gets an ear infection on top of it is an example of a mixed loss.

Slide 25



Luckily there are treatment options for hearing loss.

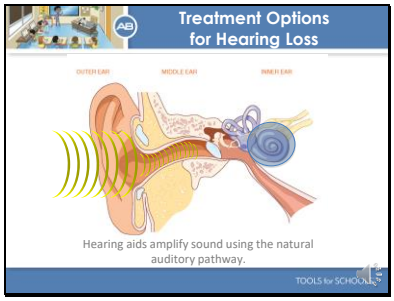
Slide 26

Now that you have a better understanding of hearing loss and how to read the audiogram you may be wondering what can be done to improve a child's ability to hear. Here are two solutions for treating hearing loss. Most children with permanent hearing loss benefit from using hearing aids or cochlear implants. These devices improve hearing sensitivity and help children hear the world around them.

Slide 27

There are different styles of hearing aids, typically children wear the behind-the-ear style.

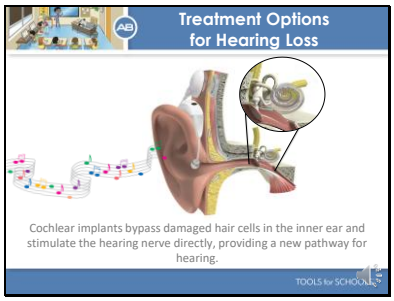
Slide 28



You may be wondering how a hearing aid differs from a cochlear implant. A hearing aid makes sound louder and delivers these sounds to the hearing system through sound waves. The sounds delivered pass through both the healthy and damaged parts of the hearing system before reaching the brain. The loudness and clarity of the sounds depends on the number of functioning hair cells inside the cochlea and the integrity of the auditory nerve pathway. For many children hearing aids are sufficient

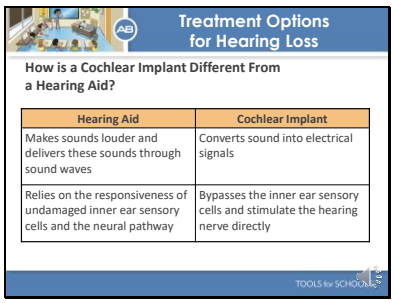
to improve hearing to an acceptable level of benefit. Cochlear implantation is considered for individuals who require access to sound that a hearing aid cannot provide.

Slide 29



A cochlear implant works differently than a hearing aid. It delivers electrical signals that represent sounds directly to the auditory nerve. The electrical signals bypass damaged areas of the auditory system and stimulate the hearing nerve directly. Cochlear implants are usually recommended for ears with severe to profound hearing loss and can significantly improve hearing. In part two of this presentation we will discuss in more detail how a cochlear implant works and how to help children with cochlear implants succeed.

Slide 30

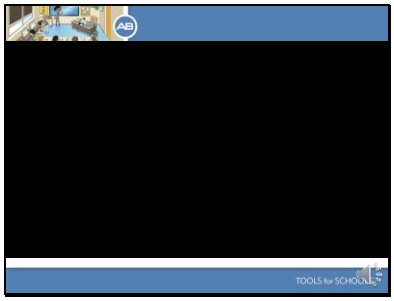


This slide provides a summary of the differences between the two devices. Again, a hearing aid makes sounds louder and sends these sounds through the natural auditory pathway. A cochlear implant converts sounds into electrical signals and bypasses damaged areas, stimulating the hearing nerve directly.

Slide 31

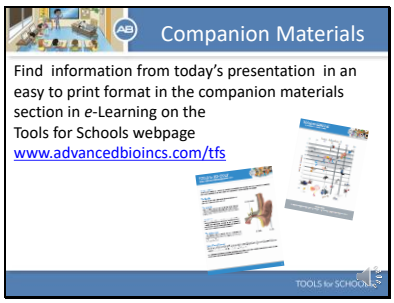
In addition, there are many social, psychological, and well-being benefits of cochlear implants such as improving academic outcomes, helping people maintain or gain employment, increasing safety, and improving overall happiness.

Slide 32



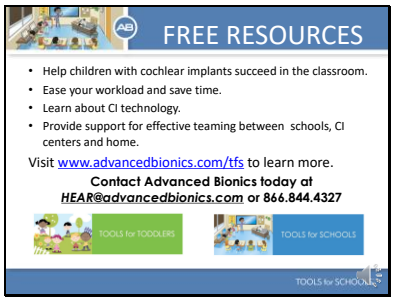
I want to end our presentation today with a video that highlights one families journey. I think you will enjoy hearing their story.

Slide 33



If you would like information from today's presentation in an easy to print format visit the eLearning section of the TFS webpage and look for the companion materials for this presentation.

Slide 34



Finally, before we wrap up I'd like to share a FREE resource offered by Advanced Bionics. The Tools for Schools and Tools for Toddlers programs offer everything you need to educate yourself and support students with cochlear implants. Make sure to visit the webpage and take advantage of all our free resources. Thanks for joining us today and we hope you will be joining us for the next part of this presentation Becoming Familiar with Cochlear Implants part two.